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Rate of Broken Bones Could Fall

If older Americans consumed extra vitamin D along with extra calcium, it might substantially reduce the enormous cost of treating broken bones in the elderly—estimated to be $13.8 billion in 1995. That's the finding of a 3-year study of 389 men and women over age 65. The group that took calcium and vitamin D supplements daily had less than half as many broken bones during the course of the study as the group that got a placebo—11 fractures versus 26. The supplements contained 500 milligrams of calcium and 700 International Units (IU) of vitamin D.

This substantial reduction in fractures can't be explained by the small changes in bone mineral density between the two groups, the researchers concluded in the *New England Journal of Medicine* (vol. 337, pp.670-676). By the end of the study, the supplemented group was only slightly ahead of the placebo group in bone mineral density, according to total body measurements and measurements of the hip and spine.

Nonetheless, some 28 million Americans who either have osteoporosis or are at high risk can benefit from the findings. The study is the first to demonstrate that extra calcium and vitamin D can reduce the effect of osteoporosis in men. And it supports findings of a French study done on elderly nursing home residents.

During the study, participants consumed a little more than 700 mg of calcium daily from their diets. That's at the high end of the typical intake for men and women over 65, which falls between 500 and 700 mg. By adding the supplements, they averaged close to the 1,200 mg now recommended for people age 51 and over. To get that amount from foods, a person would need to consume a well-balanced diet, including three sources of dairy products daily.

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Strawberry Varieties Rich in Ellagic Acid

Two strawberry varieties developed by ARS scientists are rich in ellagic acid, a natural organic compound that has been shown to inhibit certain types of cancer. Tribute and Delite strawberries had the highest ellagic acid levels among 36 varieties evaluated, the scientists reported in *HortScience* (vol. 26, pp. 66-68). They found the acid in the strawberries' seeds and fruit pulp, but the highest concentration was in the leaves. This information will help them breed strawberries with higher levels in the fruit pulp.

It's not yet known how much ellagic acid must be consumed to produce beneficial effects. But studies with the National Cancer Institute and Ohio State's Department of Preventive Medicine recommend a diet that includes strawberries, raspberries, blackberries, cranberries, walnuts and pecans—all sources of the compound.

Plants produce ellagic acid and glucose to form ellagitannins—water-soluble compounds that are easier for people to absorb in their diets. This means small amounts of ellagitannins may be more effective in the human diet than large doses of ellagic acid. Strawberries produce at least five ellagitannins, but their chemical structures and their effectiveness as anti-carcinogens have not yet been determined.

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Big Meals May Add Body Fat in Elders

As people age, they may be able to reduce their risk of accumulating body fat by eating smaller, more frequent meals. That's the message from a study comparing the fat-burning ability of eight women in their 20s with another eight in their 60s and 70s. While the seniors kept pace with their juniors after eating 250- and 500-calorie meals, they couldn't match the fat-burning rate of the younger group after a 1,000-calorie meal. Fat oxidation was about 30 percent lower in the older women after the big meal. So when older people

overindulge, the dietary fat that doesn't get burned gets stored as body fat.

On average, U.S. women in their 60s and 70s consume about 1,400 to 1,500 calories a day, according to the latest USDA survey data. So 1,000 calories is about two-thirds of a day's calorie intake for this age group. It simulates going out to a restaurant and having a big meal, say the researchers. They believe the drop in fat-burning ability may be due to hormonal changes. The older women in the study had higher levels of glucagon. This hormone triggers the release of sugar into the blood—the opposite effect of insulin. With more sugar available to fuel body processes, the women burned less fat.

Reported in the *American Journal of Clinical Nutrition* (vol 66, pp. 860-866), the study is the first to measure fat oxidation after eating and needs confirmation in further research. It was designed to get at underlying causes behind the age-related increase in body fat, which typically doubles between the ages of 20 and 50 to 60 years. That increase is linked to several diseases, including cardiovascular disease and non-insulin dependent diabetes.

The researchers recommend that seniors eat fewer calories at a sitting, but eat more often to ensure getting enough nutrients. They also suggested that older people exercise to increase skeletal muscle and fitness. This may offset the fat-burning deficiency by increasing their capacity to burn fat while resting.

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Excess Iron Can Shrink Zinc Absorption

New findings support the U.S. government recommendation that pregnant women should limit supplemental iron to 30 milligrams per day unless they have iron-deficiency anemia. Researchers from the University of California at Berkeley, California Public Health Foundation, and ARS collaborated in the 15-month study with 13 volunteers. They monitored zinc absorption rates before and after pregnancy. Results suggest that a nursing mother who takes high doses of iron might interfere with her body's ability to absorb zinc.

Four of the women took supplemental iron totaling 100 milligrams a day and had no increase in zinc absorption during lactation when the need for zinc is the greatest. The other nine did not take an iron supplement. Their ability to absorb zinc increased 30 percent in the final three months of pregnancy and 75 percent after 7 to 9 weeks of nursing, the researchers reported in the *American Journal of Clinical Nutrition* (vol. 66, pp. 80-88). The zinc content of breast milk didn't differ between the two groups, suggesting that the iron-supplemented women used zinc from other tissues, such as muscles or bone, for breast milk synthesis.

Scientists already know from animal and human studies that the body's ability to absorb zinc changes dramatically during and after pregnancy. The new study was the first to document the changes at intervals from pre-conception to about 2 months after birth. It also was the first, in humans, to suggest iron supplements might interfere with zinc absorption during lactation.

Pregnant women need zinc for normal fetal growth and development. After their babies are born, the mother needs zinc for producing breast milk. Severe zinc shortages can retard growth, impair brain function and reduce the body's ability to fight infection. Many women do not consume the recommended daily intake during pregnancy (15 milligrams) or lactation (19 mg). The richest food sources include red meat, liver, oysters, beans, whole grains, garbanzo beans and poultry.

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Dark Leafy Greens That Stay Green

A post-harvest vapor heat treatment keeps leaves of kale and collards from yellowing and reduces their loss of sugar and other nutrients in storage. Leafy green vegetables—rich sources of important nutrients and dietary fiber—are highly perishable after harvest. But kale treated at 113 degrees F for 30 minutes remained green and crisp after 7 days in storage at 59 degrees F. Collards, which are more heat sensitive, maintained their freshness for a week at the same storage temperature when first held at 104 degrees F for 60 minutes.

Scientists don't know how the heat protects the produce. But they do know that stress from heat promotes the build-up of certain proteins. These same "heat shock proteins" may also provide resistance to deterioration caused by cold storage, when produce later is stored at the lower temperatures. Further research is planned to answer these questions.

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Leptin Fading As Answer to Obesity

Leptin has become a hot area for obesity research since the discovery of a mutation in the mouse leptin gene that increases the animal's appetite while lowering its metabolic rate. New findings, however, dampen the prospect that this

hormone-like signal may explain differences in body fat among people. Researchers found no relationship between the amount of leptin in the blood of 61 men and women and the total number of calories they burned each day or their metabolic rate while resting or after eating. The study volunteers ranged in age from 18 to 81, and none were obese.

The researchers concluded in *Obesity Research* (vol. 5, pp. 459-463) that leptin doesn't influence energy regulation in adults by increasing their energy expenditure. In a study by others, young children with higher leptin levels reportedly burned more calories during physical activity. But the recent study indicates adults apparently lose their responsiveness to this signal. Because leptin is produced by fat cells, the volunteers who had more body fat also had higher blood leptin levels. But that didn't prompt them to burn more calories.

Maintaining a stable body weight is a matter of burning as many calories as we consume. In people whose weight control mechanism is working properly, the body's metabolic rate automatically revs up after periods of overeating and slows down after periods of undereating to maintain this balance. Similarly, appetite automatically adjusts by decreasing or increasing. This process of energy regulation is controlled by a sequence of metabolic signals. But the details of that sequence are still sketchy. To better understand leptin's role, the researchers examined how leptin might affect metabolic rate in adults.

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Leaner Pork From Obesity Research?

Leaner pork for consumers could be a benefit of research on human obesity. ARS scientists have been intrigued by two hormones, neuropeptide-Y and leptin. These hormones act as signals to regulate appetite. Neuropeptide-Y, found in the brain, is a "green light" that stimulates appetite. Leptin, released by the fat cell, is a "red light' that signals the brain that the body is adequately nourished and, thus, suppresses appetite. The scientists found that giving leptin to pigs increased growth hormone secretion and made them eat less. Theoretically, the potential exists for leaner pork because growth hormone stimulates lean muscle growth and suppresses adipose tissue deposition.

The scientists caution that much more needs to be learned about leptin. A group of researchers with ARS and the University of Georgia are trying to understand how animals process this hormone. ARS scientists in Beltsville, Md., are working on treatments to counter leptin's appetite-suppressing effects. ARS colleagues in Columbia, Mo., are looking at how growing piglets use leptin.

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Foods Don't Trigger Calcium Loss

Protein-rich foods don't prompt the loss of body calcium through the urine, in contrast to what some health professionals have believed. A new ARS study—confirming two other studies—finds no support for the notion that diets containing ample meat, fish and poultry increase the risk of osteoporosis. In the ARS study, 14 postmenopausal women excreted no more calcium when eating 10 ounces of meat, fish, or poultry daily for 7 weeks than when eating only 1-1/2 ounces of these high-protein foods. Researchers attribute this to the phosphorus in these foods, which appears to save calcium.

The belief that high-protein foods increase calcium loss came from earlier studies in which people consumed pure protein. But it doesn't contain phosphorus or other nutrients that may counterbalance the protein's effects, say the researchers. The findings have an important implication for elderly people, especially those with osteoporosis: They shouldn't limit their intake of protein-rich foods for fear of this disease. In fact, low serum protein has been associated with an increased risk of hip fractures. Many elderly consume too little protein and could benefit from regularly consuming moderate amounts of lean meat, poultry or fish.

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Chromium Supplements Safe

People concerned about the safety of chromium supplements can breathe far more easily. Every day during a 20-week study, rats consumed more than 2,000 times the estimated safe limit of chromium for people. The animals showed no signs of toxicity as assessed by body weight, blood chemistry and tissue analyses. Twenty weeks is about one-seventh of a rat's normal life span.

Researchers tested two widely used formulations of the mineral—chromium picolinate and chromium chloride. While neither produced toxicity, the animals stored more of the picolinate in their tissues, indicating that they absorbed more. The findings, reported in the *Journal of the American College of Nutrition* (vol. 16, pp. 273-279), support earlier reports of very low toxicity in animals. And they question the relevance of a study done two years ago using cultured human cells that reported DNA damage. Cultured cells are far more vulnerable than body cells because they lack the body's normal protective mechanisms.

For example, people generally absorb less than 2 percent of the chromium in the diet; 98 percent passes in the stool. By contrast, the cultured cells were given increasingly larger doses of chromium formulations until an effect was observed. Years of ARS chromium studies with animals and people have not identified any toxic symptoms, even when the chromium given was several times above the suggested daily upper limit of 200 micrograms (mcg). In fact, the highest daily exposure considered safe over the course of a lifetime is 350 times this upper limit. This reference dose was established by the Environmental Protection Agency.

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Heavyweight Among Blackberries

The world's largest blackberry should be ready by next spring for planting by home gardeners, pick-your-own operations and commercial growers in parts of the West and South. Dubbed Black Butte, the berry could start showing up in grocery store produce sections nationwide in the summer of 2000. Blackberries are low in fat and sodium and a good source of fiber, potassium and vitamins A and C.

Black butte's berries average 1 inch in diameter and 2 inches long and weigh more than two-fifths of an ounce. That's almost twice the size of other varieties of fresh blackberries, says the ARS researcher who developed the new variety in cooperation with the Oregon Agricultural Experiment Station. Its berries ripen in late June, four to six weeks earlier than some of the eastern varieties. It should grow well in areas where winter temperatures stay above 10 degrees Fahrenheit. The vines have been tested in Oregon, Arkansas, California, North Carolina, Washington, Canada, England and New Zealand.

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Citrus Picked to Win in Battle of the Rots

Tomorrow's grapefruit, oranges, lemons and limes might have a powerful ally to help them resist attack by microbes that cause costly decay. Scientists with ARS and Texas A&M University have discovered a beneficial microbe that fights green mold on citrus in laboratory tests. Researchers say the microbe—a helpful strain of a fungus—is easy to raise and harvest in the laboratory, and might someday reduce or eliminate the need for certain after-harvest fungicides.

The fungus is named *Geotrichum candidum*, strain AVIR. It is a beneficial, or avirulent, strain of the *G. candidum* fungus. In nature, the wild, or virulent, fungus is the well-known cause of a fruit disease called sour rot. Dipping, spraying or dusting fruit with a beneficial microbe to ward off rot-causing organisms is not new, but it's a first for the avirulent *G. candidum* strain. Researchers did the laboratory experiments with grapefruits and oranges, and suspect the microbe could be employed safely and effectively to protect other fruits as well, including apples, pears and strawberries.

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National Ag Library Has Pfiesteria Facts

Frazzled by the search for facts on *Pfiesteria*? ARS' National Agricultural Library offers some help via the World Wide Web. The library has produced a new web page devoted to *Pfiesteria piscicida*. That's the toxic organism suspected of killing fish and generating health concerns in some Maryland and North Carolina waterways.

The site provides links to North Carolina State University laboratories conducting *Pfiesteria* research, as well as other *Pfiesteria* information sites. And it offers *Pfiesteria* fact sheets produced by Maryland and North Carolina state agencies and a bibliography of scientific literature on the organism. The address: www.nal.usda.gov/wqic/pfiest.html

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